1. Amendments to the Claims:

A listing of the entire set of pending claims (including amendments to the claims, if any) is submitted herewith per 37 CFR 1.121. This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A two dimensional photonic crystal sensor apparatus comprising:

a waveguide for inputting light; and

a photonic crystal slab ~~optically coupled to said waveguide, said photonic crystal slab~~ comprising: a two dimensional periodic lattice of holes, said two dimensional periodic lattice of holes comprising: a first nearest neighbor direction and a second nearest neighbor direction; a lattice constant; and a defect hole, said photonic crystal slab ~~operable~~configured to ~~receive~~couple said light from said waveguide along said second nearest neighbor direction and ~~operable~~configured to confine said light in said defect hole at an operating wavelength, wherein a coupling efficiency of said light along said second nearest neighbor direction is greater than a coupling efficiency along said first nearest neighbor direction.

2. (Original) The apparatus of claim 1 wherein said defect hole has a larger volume than said holes.

3. (Original) The apparatus of claim 1 wherein said defect hole has a smaller volume than said holes.

4. (Original) The apparatus of claim 1 wherein said photonic crystal slab is comprised of silicon.

5. (Original) The apparatus of claim 1 wherein said two dimensional periodic lattice is a triangular lattice.

6. (Original) The apparatus of claim 1 wherein said defect hole has a substantially elliptical cross-section.

7. (Original) The apparatus of claim 1 wherein said photonic crystal sensor is operable to outcouple light from said photonic crystal slab in a direction perpendicular to said photonic crystal slab.

8. (Original) The apparatus of claim 1 further comprising a tunable optical source coupled top said waveguide.

9. (Original) The apparatus of claim 1 wherein said waveguide is a conventional ridge waveguide.

10. (Original) The apparatus of claim 1 wherein an operating wavelength of said photonic crystal sensor is determined by a dither system.

11. (Original) The apparatus of claim 1 wherein an operating wavelength of said photonic crystal sensor is determined by a synchronized scanning system.

12. (Original) The apparatus of claim 1 wherein an operating wavelength of said photonic crystal sensor is determined by a using system of multiple light emitting diodes.

13. (Original) The apparatus of claim 1 wherein an operating wavelength of said photonic crystal sensor is determined by using a slope based detection system.

14. (Original) The apparatus of claim 1 wherein a photodetector is positioned out of the

plane of said photonic crystal slab to be operable to detect said light at an operational wavelength of said photonic crystal sensor.

15. (Currently Amended) A two dimensional photonic crystal sensor apparatus comprising:

a photonic crystal slab comprising: a two dimensional periodic lattice of holes ~~with~~comprising: a lattice constant; ~~and~~ a plurality of defect holes; and a first nearest neighbor direction and a second nearest neighbor direction, said photonic crystal slab ~~operable~~configured to confine light at a plurality of operating wavelengths to said plurality of defect holes; and

a substantially straight line of defects defining a waveguide in said two dimensional periodic lattice of holes, said waveguide optically coupling said light to said plurality of defect holes along said second nearest neighbor direction, wherein a coupling efficiency of said light along said second nearest neighbor direction is greater than a coupling efficiency along said first nearest neighbor direction.

16. (Original) The apparatus of claim 14 said plurality of defect holes do not all have the same volume.

17. (Original) The apparatus of claim 14 wherein said plurality of defect holes are arranged in an order to maximize the optical coupling of said waveguide to said plurality of defect holes.

18. (Currently Amended) A two dimensional photonic crystal sensor apparatus comprising:

a plurality of input waveguides; and

a photonic crystal slab optically coupled to each of said plurality of waveguides, said photonic crystal slab comprising a two dimensional periodic lattice of holes with a lattice constant and a plurality of defect holes said two dimensional periodic lattice of

holes comprising a first nearest neighbor direction and a second nearest neighbor direction, said photonic crystal slab ~~operable~~configured to ~~receive~~couple light from said plurality of waveguides along said second nearest neighbor direction and operable to confine said light at a plurality of operating wavelengths in said plurality of defect holes, wherein a coupling efficiency of said light along said second nearest neighbor direction is greater than a coupling efficiency along said first nearest neighbor direction.

19. (Original) The apparatus of claim 17 wherein said plurality of input waveguides is optically addressed using a diffractive array generator.

20. (Original) The apparatus of claim 17 wherein said plurality of input waveguides is optically addressed using a dynamically reconfigurable diffractive array generator.

21. (Original) The apparatus of claim 17 wherein said plurality of input waveguides is optically addressed using a MEMs based dynamically reconfigurable mirror array.

22. (Currently Amended) A three dimensional photonic crystal sensor comprising:

an input waveguide; and

a three dimensional photonic crystal lattice structure optically coupled to said waveguide, said three dimensional photonic crystal lattice structure ~~having~~comprising: a defect region, a first nearest neighbor direction and a second nearest neighbor direction, said three dimensional photonic crystal lattice structure ~~operable~~configured to ~~receive~~couple light from said input waveguide along said second nearest neighbor direction and ~~operable~~configured to confine said light at an operating wavelength in said defect region, wherein a coupling efficiency of said light along said second nearest neighbor direction is greater than a coupling efficiency along said first nearest neighbor direction.

23. (Original) The apparatus of claim 22 further comprising an output waveguide

operable for outcoupling said light at said operating wavelength from said three dimensional photonic crystal lattice structure.

24.(Currently Amended) A photonic crystal sensor apparatus comprising: a waveguide for inputting; and a photonic crystal structure comprising a lattice, a first nearest neighbor direction and a second nearest neighbor direction and being optically coupled to said waveguide along said second nearest neighbor direction, ~~said photonic crystal structure comprising a lattice,~~ said lattice comprising a lattice constant and a lattice defect, said photonic crystal structure configured~~operable~~ to receive light from said waveguide and ~~operable~~configured to confine said light in said lattice defect at an operating wavelength, wherein a coupling efficiency of said light along said second nearest neighbor direction is greater than a coupling efficiency along said first nearest neighbor direction.